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13. ABSTRACT This analysis evaluated two methods of assigning Item Essentiality values to items with applications on active U.S. Navy ships. The Average method averaged the Item Mission Essentiality Codes (IMECs) and rounded the results up to the next highest integer, and the Highest method selected the highest IMEC as the Item Essentiality value. Due to a lack of Mission Criticality Code (MCC) data, 40 percent of the item's applications were not assigned IMECs. Based on the available information, the Average method assigned 11 percent of the items the highest value of 4, and the Highest method assigned 25 percent of the items a value of 4. The Highest method is more sensitive to changes caused by one application of an item and has potential to migrate all items to the higher categories. Therefore, the Average method is preferred. However, since Navy Ships Parts Control Center (SPCC) is currently loading their files using the Highest method, Navy Fleet Material Support Office (FMSO) recommends continued use of the Highest method until Resystemization.			

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ITEM ESSENTIALITY ASSIGNMENT

OPERATIONS ANALYSIS DEPARTMENT

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Mechanicsburg, Pennsylvania 17055

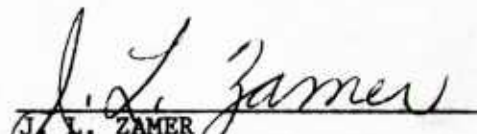
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ITEM ESSENTIALITY ASSIGNMENT

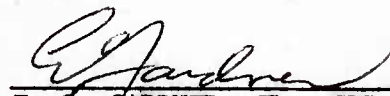
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REPORT 154A

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ABSTRACT

This analysis evaluated two methods of assigning Item Essentiality values to items with applications on active U.S. Navy ships. The Average method averaged the Item Mission Essentiality Codes (IMECs) and rounded the results up to the next highest integer, and the Highest method selected the highest IMEC as the Item Essentiality value. Due to a lack of Mission Criticality Code (MCC) data, 40 percent of the item's applications were not assigned IMECs. Based on the available information, the Average method assigned 11 percent of the items the highest value of 4, and the Highest method assigned 25 percent of the items a value of 4. The Highest method is more sensitive to changes caused by one application of an item and has potential to migrate all items to the higher categories. Therefore, the Average method is preferred. However, since Navy Ships Parts Control Center (SPCC) is currently loading their files using the Highest method, Navy Fleet Material Support Office (FMSO) recommends continued use of the Highest method until Resystemization.

EXECUTIVE SUMMARY

1. Background. Item Essentiality indicates the importance of an item to the Navy Supply System and is used to determine safety levels. Item Mission Essentiality Codes (IMECs) are basically determined from Mission Criticality Codes (MCCs). Since IMECs are independently assigned to every application of an item, several different IMEC values can be assigned to the same item. Navy Fleet Material Support Office (FMSO) previously performed an analysis to assign a single Item Essentiality value to a sample of Navy Ships Parts Control Center (SPCC) repairables based on Item Mission Essentiality Codes (IMECs). FMSO was tasked to conduct a follow-on analysis using more complete MCC data. Neither the original study or this follow-on analysis include Navy Aviation Supply Office (ASO) managed items due to a lack of IMEC information.

2. Objective. Develop a methodology to assign a single Item Essentiality value per item based on the item's IMEC values.

3. Technical Approach. This study analyzed two methods of assigning Item Essentiality. The Average method, which was recommended in the original study, assigns the average of the item's IMEC values as the Item Essentiality value for an item. All fractions are rounded up to the next integer in this method; i.e., 2.1 equals 3. The Highest method selects the item's highest IMEC value as the Item Essentiality. A data base to analyze these methods was constructed from the Weapons Systems File (WSF). The data base contained every application of items installed upon active U.S. Navy ships. A method was recommended based on the Item Essentiality distributions developed by each method. The distributions show the percent of items which were assigned each of the various Item Essentiality values.

4. Findings. Although this analysis includes more items and applications than the original study, the data remain incomplete. Over 45 percent of the SPCC Universe and 30 percent of the Navy-related Defense Logistics Agency (DLA) Universe of items were included in the study. Many equipments have not received MCCs (and hence IMECs) so Item Essentiality values could not be assigned. Of the items analyzed in this study, 40 percent of their applications were not assigned IMECs, 80 percent of the items had at least one application without an IMEC and 15 percent of the items received no IMECs for any of their applications. Based on the data available, the Average method assigned 11 percent of the items the highest essentiality value of 4, and the Highest method assigned 25 percent of the items a value of 4. Originally the Chief of Naval Operations (CNO) estimate was that 5 percent of the items would receive values of 4. The incomplete data are predicted to have lower IMECs than the applications currently assigned IMECs. However, the Highest method is more susceptible to drastic changes when that information becomes available.

5. Conclusions. The main concern with the Highest method is that too many items will eventually migrate to the most essential categories, and thus eliminate the capability to allocate scarce dollar and personnel resources to the most critical items. Since the Average method assigns fewer 4s, the Average method would be less likely to create this problem. In terms of implementation, both methods require similar data and programs; however, SPCC has already developed a unique procedure to load the Highest value into their files.

6. Recommendation. FMSO recommends continued use of the Highest method until Resystemization. FMSO recommends the Average method be programmed and implemented during Resystemization.

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I. INTRODUCTION

Naval Supply Systems Command (NAVSUPSYSCOM) tasked Navy Fleet Material Support Office (FMSO) as described in reference (1), to perform an Operations Analysis study to determine a method of assigning Item Essentiality values. (All references of this report are listed in APPENDIX A.) This tasking was completed and documented in reference (2). Since the completion of reference (2), additional items have been assigned Mission Criticality Codes (MCCs). Therefore, this follow-on analysis was initiated by reference (3) to include more Cognizance Symbols (Cogs) and the most current MCC assignments.

Item Essentiality values indicate the importance of an item; i.e., National Item Identification Number (NIIN), to the Navy Supply System. The intended use of Item Essentiality values is to determine safety level protection at the Afloat, Ashore and Wholesale levels of the Supply System. Studies have already commenced at FMSO to analyze various methods of applying Item Essentiality to levels setting in the Ashore and Wholesale areas and are described in references (4) and (5), respectively. The Afloat analysis will begin in October of 1984 and is described in reference (6). Item Essentiality values will be used in these studies to determine effectiveness goals by Item Essentiality and to quantify the budgetary impact.

Item Essentiality values are developed from Item Mission Essentiality Codes (IMECs). IMEC is determined from the part Military Essentiality Code (MEC) and the equipment MCC. MEC represents the importance of a piece part to an equipment and MCC indicates the importance of an equipment to the mission assignment of the military unit in which the equipment is installed. IMEC relates the importance of a piece part to the unit's mission assignment.

The MEC is assigned values 1 or 3, with 1 signifying the item is vital, and 3 indicating the item is nonvital to the equipment upon which the item is installed. The MCC values range from 1 through 5 and A through E, with greater values representing higher essentiality. The alphas represent about 1.5 percent of MCC values and are synonymous with numerics such that A equals 1 and B equals 2.

The MCC development concept was based on Casualty Reports (CASREPs) and was documented in reference (7). The five steps shown here explain the process for developing MCCs:

- . MCC 5 was assigned to life support material.
- . MCC 4 was assigned if the ratio of C3 plus C4 CASREPs to C2 CASREPs was at least one to five and the ratio of C4 to C3 CASREPs was as at least one to three; i.e.,

$$\frac{C3+C4}{C2} \geq \frac{1}{5} \text{ and } \frac{C4}{C3} \geq \frac{1}{3}$$

- . MCC 3 was assigned if the ratio of C3 plus C4 CASREPs to C2 CASREPs was at least one to five, but the ratio of C4 to C3 CASREPs was less than one to three; i.e.,

$$\frac{C3+C4}{C2} \geq \frac{1}{5} \text{ and } \frac{C4}{C3} < \frac{1}{3}$$

- . MCC 2 was assigned if the ratio of C3 plus C4 CASREPs to C2 CASREPs was less than one to five; i.e.,

$$\frac{C3+C4}{C2} < \frac{1}{5}$$

- . MCC 1 was assigned if there were no historical CASREPSs.

According to the equations above, an item must receive at least six C2 CASREPs for each C3 and C4 CASREP in order for an item to be assigned an MCC value less than 3.

The IMEC and Item Essentiality values also range from 1 through 5, again with greater values indicating higher essentiality. TABLE I shows the IMEC value which is assigned for each of the possible combinations of MEC and MCC values. When the MEC is 1, the IMEC is assigned the same value as the MCC, and when the MEC is 3, the IMEC is assigned a value of 1. Ninety-nine percent of MEC values are 1.

TABLE I
IMEC DETERMINATION

MEC Item to Equipment	MCC Equipment to Mission	IMEC Item to Mission
1	5 or E	5
1	4 or D	4
1	3 or C	3
1	2 or B	2
1	1 or A	1
3	Any of Above	1

The same item installed in various equipments can be assigned different IMEC values because each application of an item receives its own IMEC. The objective of this study is to develop a methodology to assign a single Item Essentiality value per item based on all application IMECs to represent the importance of the item to the Navy Supply System. Specific definitions for Item Essentiality values are stated below in TABLE II.

TABLE II
ITEM ESSENTIALITY DEFINITIONS

Item Essentiality Value	Definition
5	items related to life support and personnel safety material; e.g., life rafts and oxygen masks
4	lack of item causes total loss of primary mission capability
3	lack of item results in severe degradation of primary mission capability
2	lack of item results in loss of secondary mission capability
1	lack of item causes minor mission impact

The original reference (1) analysis evaluated 15 methods from which FMSO recommended the Average method. SPCC preferred the Highest method. The original study included only samples of 7H and 7G Cog items and had just 40 percent of the IMEC data. Since more information is now available and SPCC disagrees with the original recommendation, this follow-on analysis was initiated to include all items installed upon active U.S. Navy ships.

II. TECHNICAL APPROACH

A. ITEM ESSENTIALITY DETERMINATION. This study compared the Average and Highest methods of assigning Item Essentiality. These two methods were chosen because the Average method was recommended in reference (2), and the Highest method is preferred by SPCC. The Average method sums the IMEC values assigned

to every application of the item, and divides the sum by the total number of applications of the item. All fractions are rounded up to the next integer in this method; e.g., 2.1 equals 3. The Highest method selects the highest IMEC value assigned to any of the item's applications as the Item Essentiality value for the item. For example, if an item had 100 applications with 99 of the applications coded as IMEC 3 and the remaining application coded as an IMEC 4, both the Average and Highest method would assign an Item Essentiality value of 4. An item with a total of three applications, one 2, one 3 and one 4, would receive a 3 from the Average method and a 4 from the Highest method. SPCC is currently loading their files using the Highest method.

B. INPUT. Since MCC data are developed from CASREP information which is reported only from active ships, this analysis includes all SPCC items which are installed upon active ships. The specific Cogs are: 1H, 7H, 7G, 7E, 9N, 9Z, 9C and 9G. The 9 Cog material for this study pertains only to SPCC applications. Navy Aviation Supply Office (ASO) managed items and 9 Cog aviation applications were excluded due to a lack of MCC information. A similar study will be conducted for ASO material when the necessary data become available.

The Average and Highest methods both determine Item Essentiality based on IMECs which are assigned to every application of an item. An item's application is considered to change whenever the item is installed upon a different Repairable Identification Code (RIC), equipment or ship. A RIC identifies a particular Allowance Parts List (APL) on which the item is installed. An equipment is designated by Equipment Identification Code (EIC) and a ship is specified by Unit Identification Code (UIC). Therefore, an item receives an IMEC for every different RIC, equipment and ship the item is installed upon.

To assign Item Essentiality, a file was created consisting of every RIC, EIC and UIC combination for all NIINs installed upon active ships. This type of configuration was constructed from the General Distribution Allowance Parts List (GDAPL) and the Weapons Systems File Download (WSFD) which are created from the WSF. Basically, the GDAPL contains every RIC at SPCC and every NIIN associated with a RIC. The MEC is contained in this file. Only NIINs which are not included on any APL are excluded from this file. In general, the WSFD consists of every active ship, and every EIC and RIC associated with those ships. The WSFD also contains the MCC.

The GDAPL and WSFD were matched against each other by RIC to compute IMEC values and create the file containing every NIIN, RIC, EIC and UIC combination for items installed upon active ships. When applications matched from the WSFD and GDAPL by RIC, the records were "exploded" or multiplied together. For example, if there were three records on the GDAPL and four records on the WSFD with the same RIC, then 12 records were created on the IMEC file to represent every application for each NIIN on the GDAPL.

The GDAPL is created biannually and the WSFD is updated monthly. The September 1983 edition of the GDAPL and the December 1983 edition of the WSFD were utilized for this analysis.

C. OUTPUT. The Average and Highest methods were applied to the input file to create Item Essentiality distributions showing the percent of items which were assigned the different Item Essentiality values under both methods. The results were segmented by Cog and also displayed for SPCC and Defense Logistics Agency (DLA) totals. Although many more applications had been assigned MCC values for this analysis than in reference (2), the assignments are still not complete. Statistics were compiled to quantify the completeness of MCC and IMEC data. Some items were not assigned any IMEC values due to a lack of

information. These items were treated in three different manners when processed through the Average and Highest methods: (1) excluded from processing, (2) assigned values of 1, and (3) assigned values of 4. Assigning values of 1 and 4 illustrates the lower and upper bound possibilities for when the unassigned IMEC information becomes available.

Values of 5 were originally intended to identify life support items. However, during the MCC coding process, some items which should have received a value of 4 were incorrectly coded with a value of 5 and vice versa. Therefore, this analysis considered all 5s as 4s. Item Essentiality values were designed to determine safety level protection. Since 5s and 4s are expected to receive equally high safety level protection, grouping 5s with 4s does not cause any bias in this study.

D. EVALUATION CRITERIA. A method to assign Item Essentiality values was recommended primarily based on the Item Essentiality distributions produced by the two methods analyzed. The expected distribution shown in TABLE III was forwarded and approved by references (8) and (9).

TABLE III
DESIRED ITEM ESSENTIALITY DISTRIBUTION

	Item Essentiality Distribution			
	1	2	3	4
Percent Items	15	40	40	5

The distribution displayed in TABLE III was developed before a representative sample of Item Essentiality values was analyzed. It is believed the distribution was developed as a general guideline, but was not intended as an exact distribution.

III. FINDINGS

A. INPUT STATISTICS. Item Essentiality values were determined from an IMEC file which was developed from the GDAPL and WSFD. Therefore, statistics pertaining to the GDAPL, WSFD and IMEC files are discussed before the Item Essentiality distributions.

1. GDAPL Statistics. The GDAPL contains every SPCC APL RIC and every NIIN contained on each APL. The MEC which signifies the importance of a NIIN to the EIC is also stored on this file. GDAPL data which are considered pertinent to this analysis are listed below:

TABLE IV

GDAPL DATA

Cog	NIINs	Percent of NIIN Universe
1H	204,419	80
7H	40,865	92
7G	14,945	83
7E	3,908	97
SPCC Total	264,137	82
9N	308,488	56
9Z	211,519	47
9C	158,930	65
9G	71,707	51
DLA Total	750,644	54

- . 9,357,058 total records
- . 389,840 unique RICs
- . 99 percent of MECs are 1 (vital)

The table illustrates that the large majority (91 percent) of SPCC repairable items are on at least one APL. As expected, not as many (80 percent) LH items are listed on an APL. However, since LH items comprise more than 75 percent of all SPCC managed items, the SPCC total is predominantly reflective of LH items. Also as expected, an even lower percentage (54 percent) of DLA managed items were contained on the GDAPL. This is a result of excluding aviation applications. Permanent Navy Item Control Numbers (NICNs) were excluded from the GDAPL statistics because these items are not processed through levels (do not receive safety level) and hence, do not require Item Essentiality values. Temporary NICNs were also excluded from the GDAPL in this analysis, because there was no way to determine which Cog the items would be assigned. Since they generally have few multiple applications, the method of computing Item Essentiality is not as critical for these items.

2. WSFD Statistics. The WSFD contains every active ship (UIC) in the Navy, and every EIC and RIC associated with those ships. The MCC which relates the importance of an equipment (EIC) to a mission assignment is also located on this file. WSFD data which are considered pertinent to this analysis are listed below. Since the WSFD configuration does not go down to the NIIN level, Cog statistics are not applicable. The original record count of the WSFD was reduced from nearly seven million to just under three million by excluding Repairable Identification Number (RIN) records. These records provide technical information; e.g., location of component on ship, but cannot affect the MCC value.

TABLE V
WSFD DATA

	MCC Values			
	1	2	3	4
Percent Records	34	38	19	9

- . 30 percent of the WSFD records were not coded and were excluded from the statistics in TABLE V
- . 2,904,464 total records
- . 621 unique UICs
- . 221,972 unique RICs

To save machine time, SPCC initially left the MCC 1 records blank. Only four percent of the records from the December 1983 WSFD used in this analysis were coded with MCCs of 1. For this study, uncoded records with complete EICs (20 percent of the WSFD) were assigned values of 1. Thirty percent of the records on the WSFD remained uncoded and were not included in the statistics of TABLE V. Therefore, the four percent of the MCCs originally coded as 1s added with the 20 percent which were assigned 1s equates to 24 percent of the Universe and 34 percent of the records which received MCC values. The uncoded records have not received MCC assignment because of incomplete EIC information or simply the MCC has not yet been determined. SPCC representatives, per reference (10), believe the large majority of the 30 percent uncoded MCCs from the WSFD (active ship applications) will eventually be assigned values of 1 and possibly some 2s, but very few will be 3s or 4s.

3. IMEC File Statistics. The GDAPL and WSFD were matched against each other by their common characteristic of RIC to develop the IMEC file. The IMEC file contains every NIIN, RIC, EIC and UIC combination for items installed upon active ships. Each record for a NIIN on this file represents a different application for that item. The IMEC file data which are considered pertinent to this analysis are listed in TABLE VI.

TABLE VI
IMEC FILE DATA

COG	NIINs	% OF UNIVERSE	TOTAL APPLICATIONS	AVERAGE APPLICATIONS PER NIIN	% IMECs UNCODED	% ITEMS WITH AT LEAST ONE IMEC UNCODED	% ITEMS WITH EVERY IMEC UNCODED
1H	104,970	41	4,877,136	46	40	78	17
7H	28,898	65	1,026,143	36	41	82	14
7G	6,935	38	449,412	65	45	93	19
7E	390	10	5,513	14	66	67	25
SPCC	141,193	44	6,358,204	45	40	79	16
9N	186,516	26	30,989,331	166	44	90	16
9Z	128,411	42	11,562,030	90	33	80	14
9C	84,926	53	3,831,874	45	32	76	14
9G	43,844	31	4,199,858	96	42	83	16
DLA	443,697	32	50,583,093	114	41	84	15

The percent of the Universe of NIINs with applications on active ships was greater for SPCC managed items (44 percent) than DLA managed items (32 percent), because ASO applications were excluded for the 9 Cog material. This is particularly evident for the 9N Cog material (26 percent) which is largely installed on Aviation equipments. Just 10 percent of the 7E Cog items have applications on active ships. The DLA managed items average two and one-half times more applications per NIIN than the SPCC managed items. This figure could increase drastically when the ASO applications are included. Forty percent of the IMEC values were uncoded due to a lack of MCC data. Approximately 80 percent of the items have at least one application with an uncoded IMEC, and 15 percent of the items did not have an IMEC for any application.

The IMEC distributions shown in TABLE VII reveal that SPCC managed items receive higher IMEC values than DLA managed items. Thirty-nine percent of SPCC materials were assigned 3s, whereas 25 percent of DLA materials were assigned 3s. Due to the manner in which IMECs are determined and the fact that 99 percent of the MEC values from the GDAPL were coded vital, 99 percent of the applications received the same IMEC value as their MCC. Comparing the IMEC distribution in TABLE VII with the MCC distribution in TABLE V, shows there are many more IMEC values of 3 than MCC values of 3. This is a result of more items installed on MCC 3 equipments than any other value. For this reason, IMEC values have a greater percentage of high essentiality values than MCCs.

TABLE VII
IMEC DISTRIBUTIONS

		IMEC VALUES			
		1	2	3	4
Percent Applications	SPCC	22	33	39	6
	DLA	29	42	25	4

. 40 percent of the IMEC values were not coded and were excluded from the statistics in TABLE VII

B. ITEM ESSENTIALITY DISTRIBUTIONS. Item Essentiality distributions were computed under three different scenarios: (1) exclude applications with unassigned IMECs, (2) arbitrarily assign the lowest IMEC value of 1 to unassigned IMECs, and (3) arbitrarily assign the highest IMEC value of 4 to unassigned IMECs. The second and third scenarios give the reader a feeling for the sensitivity of the coding algorithms being considered.

1. Excluding Uncoded IMECs. The IMEC file was processed through the computations of the Average and Highest methods to produce the following Item Essentiality distributions which show the percent of items that were assigned the different Item Essentiality values. The statistics in TABLE VIII exclude the applications with uncoded IMEC values. Therefore, 40 percent of the applications and 15 percent of the items from the IMEC file were eliminated from the statistics displayed in TABLE VIII.

TABLE VIII
Item Essentiality Distributions

COG	METHOD	ITEM ESSENTIALITY VALUES				% ITEMS ASSIGNED SAME VALUE BY BOTH METHODS
		1	2	3	4	
1H	Avg	9	29	49	13	82
	High	9	18	50	23	
7H	Avg	7	28	53	12	83
	High	7	18	51	23	
7G	Avg	7	37	54	2	76
	High	7	24	56	13	
SPCC TOTAL	Avg	9	29	50	12	82
	High	9	18	50	23	
9N	Avg	14	38	44	4	71
	High	14	22	44	20	
9Z	Avg	6	31	47	16	75
	High	6	21	39	34	
9C	Avg	3	32	48	17	82
	High	3	26	39	32	
9G	Avg	9	44	41	6	78
	High	9	32	41	18	
DLA TOTAL	Avg	9	36	45	10	75
	High	9	24	41	26	

. 7E Cog material was excluded from TABLE VIII due to insufficient MCC data

TABLE VIII includes 37 percent of the Universe of SPCC items and 27 percent of Navy related DLA items. The Item Essentiality distribution shows a much greater percentage of high essentiality values than the IMEC and MCC distributions. The Highest method assigned 25 of all SPCC and DLA items an Item Essentiality value of 4, whereas the Average method assigned about 11 percent of the items a value of 4. Both methods assigned the value of 3 more

frequently (nearly 50 percent) than any other value. The difference in items assigned 4s by the Average and Highest methods was compensated for by the difference in items assigned 2s. The Average method assigned a value of 2 to approximately 33 percent of all items, whereas the Highest method assigned a value of 2 to about 20 percent of all items. Both methods assigned a value of 1 to 9 percent of the items. Every application of an item must have an IMEC value of 1 for either method to assign an Item Essentiality value of 1. Approximately 80 percent of the items were assigned the same Item Essentiality value by both methods.

The 9N Cog contains more items than any other DLA Cog. Therefore, the overall statistics for DLA material are greatly influenced by 9N Cog. Although about 33 percent of the 9Z and 9C Cog items were assigned 4s by the Highest method, the overall DLA statistics show just 26 percent of the items were assigned a value of 4. The percent of DLA items assigned 4 by the Highest method was brought down by the lower percent of 9N items (20 percent) assigned 4s. As illustrated in TABLE VI, more 9N items (90 percent) had at least one unassigned IMEC than any other Cog because a large percent of 9N items and applications pertain to Aviation. When Aviation IMEC information becomes available, the percent of 9N items assigned 4s by the Highest method may increase and hence the percent of DLA items assigned 4s may increase. The Average method is less susceptible to drastic changes than the Highest method because all new values would be averaged with the current values.

Further analysis was performed on items which were assigned 4s by the Highest method but were not assigned 4s by the Average method. There were 12,089 SPCC items (eight percent of SPCC items analyzed) and 47,781 DLA items

(12 percent of DLA items analyzed) which received 4s by the Highest method but not by the Average method. Eighty percent of these items were assigned 3s by the Average method and the remaining 20 percent were assigned 2s. No item assigned a 4 by the Highest method could be coded a 1 by the Average method due to the rounding technique. Of those items assigned 3s by the Average method just six percent of their IMECs were 4s, and of the items assigned 2s only seven percent of their IMECs were 3s or 4s.

2. Assigning 1s to Uncoded IMECs. As previously stated, reference (10) speculates the large majority of unassigned MCC values for active ship applications (30 percent of WSFD) will eventually be coded as 1s. Therefore, the IMEC values which were uncoded due to a lack of MCC information (40 percent of IMEC file) were assigned values of 1, and the file was processed through the Average and Highest computations again to produce the TABLE IX Item Essentiality distributions. For simplification, the values by Cog were excluded from TABLE IX and only the aggregate for SPCC and DLA are displayed.

TABLE IX
ITEM ESSENTIALITY DISTRIBUTIONS
(UNASSIGNED IMECs = 1)

		Item Essentiality Values			
	Method	1	2	3	4
SPCC	Avg	24	43	28	5
	High	24	15	42	19
DLA	Avg	24	49	24	3
	High	24	19	35	22

This table includes the 15 percent of items which were previously not assigned any IMEC values. All of these items were assigned Item Essentiality values of 1 by both methods since all of their applications received IMEC values of 1. Twenty percent of the TABLE VI items had IMECs for every application. Therefore, the Item Essentiality values for those items remained the same as in TABLE VIII. For the remaining 80 percent of the TABLE VI items which had at least one application with an uncoded IMEC, Item Essentiality values could change when recomputed by the Average method, but remained the same for the Highest method.

The same number of items were assigned values of 2, 3 and 4 by the Highest method in TABLES VIII and IX, because items receiving an IMEC of 1 which already had IMECs of 2 or greater would remain coded with the same Item Essentiality value by the Highest method. The percent of items coded as 2s, 3s and 4s decreased because more items were added to the sample and assigned values of 1. Using the Highest method the percent of 4s for SPCC and DLA only decreased by four percentage points when 15 percent more items were included as 1s and 40 percent of the applications were assigned values of 1.

Since MCCs are based on CASREPs which are only reported from active ships, just 44 percent of the total universe of SPCC items and 32 percent of Navy interest DLA items were included in this Item Essentiality distribution. More DLA items were excluded from this analysis because ASO applications were not available for the study. The majority of SPCC and DLA items were not included in TABLE IX. Assuming every shore base item (approximately 60 percent of SPCC related items) and the 15 percent of items pertaining to active ships which did not receive any IMEC values were all assigned Item Essentiality values of 1, the Average and Highest methods would assign Item Essentiality

values of 4 to two percent of the SPCC Universe and eight percent of the SPCC related DLA items. These are the lowest possible percentages of items which can be assigned Item Essentiality values of 4.

3. Assigning 4s to Uncoded IMECS. Assuming the unassigned IMEC values for items only installed upon active ships (excluding shore base related items) were all 4s, produces 55 percent 4s by the Average method and 88 percent 4s by the Highest method. Although this later case is purely hypothetical, it illustrates that the Highest method is more susceptible to drastic change when the additional MCC information is obtained.

C. PRICE DISTRIBUTIONS BY ITEM ESSENTIALITY. TABLE X displays the replacement prices of items segmented by Item Essentiality (applying the Average method) and Cog. The table shows for nearly every Cog, the costs of 4s are greater than 3s, which are greater than 2s, which are greater than 1s. The only exception is for 7G material in which 3s are more expensive than 4s, but 4s are more expensive than 2s and 1s. The costs of items with uncoded Item Essentiality values are also shown in TABLE X. The costs of the uncoded items are most closely related to the costs of 3s.

TABLE X
PRICE DISTRIBUTIONS BY ITEM ESSENTIALITY
(DOLLAR VALUES)

COG	ITEM ESSENTIALITY VALUES				
	1	2	3	4	UNCODED
1H	1,167	1,235	1,543	4,362	3,173
7H	3,885	4,453	5,958	11,270	6,641
7G	3,010	3,859	5,411	4,871	3,929
9N	45	57	81	97	64
9Z	27	52	55	84	112
9C	232	364	429	738	578
9G	137	216	307	502	404

IV. SUMMARY AND CONCLUSIONS

A study to assign Item Essentiality values was performed on samples of 7H and 7G Cog items and documented in reference (2). This follow-on analysis pertains to all SPCC items and SPCC related DLA applications aboard active ships. As shown in TABLE XI, approximately 45 percent of the SPCC Universe and 30 percent of the Navy-related DLA Universe of items were included in this analysis. Due to the vast amount of incomplete MCC information, 40 percent of these items' applications were not assigned IMECs, 80 percent of the items had at least one application without an IMEC and 15 percent of the items received no IMECs for any of their applications.

TABLE XI
SUMMARY INPUT STATISTICS

	% of NIIN Universe	% IMECs Uncoded	% Items with at Least One IMEC Uncoded	% Items With Every IMEC Uncoded
SPCC	44	40	79	16
DLA	32	41	84	15

The essentiality distributions resulting from the Highest method and the Average method are shown in TABLE XII. Based on the data available, the Average method assigned 11 percent of the items the highest value of 4, and the Highest method assigned 25 percent of the items a value of 4. The original CNO estimated distribution was only five percent of the items with a value of 4. Nearly 80 percent of the items were assigned the same value by both methods.

TABLE XII
ITEM ESSENTIALITY DISTRIBUTIONS
(EXCLUDING UNCODED IMECs)

		ITEM ESSENTIALITY VALUES				% ITEMS ASSIGNED SAME VALUE BY BOTH METHODS
		1	2	3	4	
SPCC	Avg	9	29	50	12	82
	High	9	18	50	23	
DLA	Avg	9	36	45	10	75
	High	9	24	41	26	

It has been predicted that the overall distribution for the unassigned MCCs will be lower than that observed in this study. That remains to be seen. Additional applications not considered in the study include SSBNs, Coast Guard,

training centers, communications bases, and all Aviation applications. The method of selecting the highest IMEC as the Item Essentiality is more susceptible to drastic changes when additional MCC data become available and as weapons are phased out. This is particularly true for DLA Cogs with both SPCC and ASO applications.

SPCC strongly believes an item which is assigned an IMEC of 4 for any application should be assigned an Item Essentiality of 4 (Highest method) and given the maximum safety level protection. The Highest method would obviously produce the best effectiveness if there were no budget constraint. Although the budgetary impact was not quantified in this analysis, it is being analyzed for the Highest method in other FMSO studies. The main concern with the Highest method is that too many items could eventually migrate to the most essential categories. When providing safety level protection by Item Essentiality, values of 4 are intended to receive greater safety level protection than all other items. If too many items are coded as 4s, the capability to allocate scarce dollar or personnel resources to the most critical items will be lost.

The Average method assigns 4s to less than half of the items which were assigned 4s by the Highest method. By reducing the number of 4s, maximum safety level protection can be provided for these items with less chance of budget constraints. The Average method assigns 3s to 80 percent of the remaining items which were assigned 4s by the Highest method. These items will receive above average safety level protection without jeopardizing protection for the most essential items of the Navy Supply System.

In terms of implementation, both methods require similar data and programs; however, SPCC has already developed a unique procedure to load the Highest value into their MDF.

V. RECOMMENDATION.

FMSO recommends the Highest method be approved as an interim approach until Resystemization. FMSO recommends programming the Average method in Resystemization.

APPENDIX A: REFERENCES

1. COMNAVSUPSYSCOM ltr 04A6/LJB of 24 Mar 1982
2. Operations Analysis Report 154
3. FMSO ltr 9322-D33/JLZ/299 5250 of 30 Dec 1983
4. FMSO ltr 9323-F89/CMR/23 5250 of 7 Feb 1984
5. FMSO ltr 9322-D37/JLZ/143 5250 of 6 Jul 1984
6. FMSO ltr 93S/CAS/145 5250 of 17 Jul 1984
7. Operations Analysis Report 143
8. CNO memo Ser 412E/3973834 of 28 Jun 1981
9. OASD (MRA&L) memo of 25 Oct 1981
10. Mtgs between Representatives from SPCC Code 04 and FMSO Code 93 on 2 May 1984 and 17 May 1984

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